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EDUCATION

THE discussion by the Manchester Juniors on Dr. Braunholtz's Address to them on the education of the young gas engineer was so extraordinarily good that he should be encouraged to repeat it in other centres. The Address is published in full in the current issue of "GAS." The Author evidently enjoyed himself. Distinguishing education from vocational training he stressed in the widest, loftiest terms the necessity for a sound general education as a basis and background for the vocational training. What is desirable, said one speaker, is that a broad knowledge of the fundamental laws of nature should precede specialization in any one particular branch.

Paraphrasing what Dr. Braunholtz said we may put it that the superstructure of professional knowledge must be built up progressively from the foundation of fundamental ideas. First and foremost must be a sound knowledge of the English language, the vehicle of expression, and an assiduous training in its use. The neglect of this obvious requirement in recent times and in many schools is a matter of serious concern. We older men, remembering the gruelling exercises in English which were such a marked feature of our own elementary education, are often astonished at the slipshod, haphazard fashion in which it is presented to our children. "The same old story," of the poor quality of the English, sometimes almost amounting to illiteracy, which disfigures examination answers, will continue to be told until this subject is reinstated throughout our whole school system in the paramount position it used to occupy. And a high standard of English should be insisted upon throughout the whole period of education and subsequent vocational training.

If that much is agreed we may proceed to set out the other elements of the foundation work comprised in a broad knowledge of the fundamental laws of nature. It is a question of acquiring an adequate set of intellectual tools, and in the acquisition of this knowledge a study of the history of the developments of these laws and the reasoning upon which they are based should give a sufficient training in logic. That logic was not mentioned in the discussion is perhaps proof that most people are now agreed that a study even of the elementary principles of abstract logic is not necessary, a conclusion which is open to question. And which of the laws of nature should be studied and in what order of importance? Without a good grounding in elementary mathematics, including geometry, no great progress can be made in dealing with problems in quantity and space which arise in all the technique of science. After that the indispensable intellectual tools include the laws of matter and motion, which means mechanics, physics, chemistry. And we think there is good ground for the suggestion that School Certificate standard or even a little more should be required of every student before he proceeds to technology at all. It is singular that no such requirements are specified, in the Institution's Education Scheme, for candidates for Ordinary and Higher Grade Certificates, but satisfactory that they are specified in the case of the Diploma Examination.

Dr. Braunholtz gave an admirable exposition of the Institution's Education Scheme and particularly of the proposed examination for Associate Membership bringing it into line with the standards and requirements of the other engineers' institutions. The common preliminary examination will put an end to the existing anomaly in this respect. Having dealt with the particular case of the education of the gas engineer, Dr. Braunholtz turned, with pleasure, one felt, both to himself and his audience, to the question of education in general. And quite appropriately too, because the gas engineer should be an educated man. "How then do we recognize the educated man?" Dr. Braunholtz wisely refrained from any definite answer, contenting himself with the observation that education manifests itself in such ways as a "wide interest, vision, general information, capacity for self-expression, tolerance, manners, personality." In his view, and it is one which all should endorse, "corporate membership of such an Institution as ours should be a hallmark not only of technical knowledge and experience but also of a fair standard of general culture."

There is much more in this admirable Address, which should be widely studied and discussed, particularly by the Junior Associations.

FUEL EFFICIENCY

THE rise of the Institute of Fuel is a phenomenon to which, no doubt, gas engineers have given much attention. Founded in 1926 it has, in the words of Professor W. M. Cumming, speaking at the recent Scottish Fuel Efficiency Conference, already referred to in our columns, emerged from a small youthful body to one of full maturity, which has now the right, conferred by Royal Charter, of regulating the training and certification of all who would wish to adopt fuel technology as a profession. That it has reached this proud position is largely due to the efforts and nurture in the first place of Mr. P. C. Pope and finally those of Dr., now Sir, Ernest Smith. That it should claim to embrace within its influence all fuel technologists is sufficiently remarkable. True, it appears to accept the examinations of the Institution of Gas Engineers as sufficient to qualify for its membership, but it is noticeable that the subject of carbonization is included in its syllabus only with the adjective "low temperature," unless the subject "gaseous fuels" may be taken as some concession to a branch of fuel technology with nearly 150 years of life behind it. Not that we have any fault to find with the breadth of view evinced by Professor Cumming's Address. His attitude was quite impeccable. He emphasized the necessity for the widest

possible general education of the student in his early years. "Too early specialization is not looked upon with favour." It is of the utmost importance to inculcate and develop the scientific method and to cultivate the scientific attitude. Chemistry and physics are the foundations of fuel technology and they will serve as well as any other of the sciences as media for the inculcation of a sound scientific training.

It is to be hoped, however, that too narrow a view will not be taken of the duties of a body which aspires to cover the whole field of fuel. Too much emphasis can be laid on the need for efficiency in the use of solid fuel. There is plenty of need for that. But a survey of the whole field should mark out the area which should be occupied by the several classes of fuel, and, particularly with regard to coal, the uses which should be made of the several broad varieties. In short the Institute can only sustain its pretentions if it grasps, on its technical side, the problem of fuel as a whole, for which purpose on the administrative side, surely, the Ministry of Fuel and Power was set up. That the Institute is not always clear about this wider aspect of the matter was indicated in one of the several Papers presented at this Conference—that by Dr. E. A. C. Chamberlain, in which he described some new appliances for the use of solid fuel for space heating, water heating, and cooking. Nearly all of these are commended because they can use bituminous coal as well as coke, anthracite, and so on. But should bituminous coal be used for any of these purposes? Should not the gas engineer at least stand by the proposition that all bituminous coal should be processed—*i.e.*, carbonized—before use as a combustible? And can the open fire ever be a perfectly satisfactory space-heater however much improved in efficiency and however combined with cooking and weater-heating?

Apart from all this, Professor Cumming's comments were of considerable interest and certainly of importance. Mr. Barry Cuthill described district heating at Dundee. Water is heated in boilers fired by coal and supplied at something between 120°F and 140°F to householders at 6s. 6d. and 5s. 6d. per week per tenant, prices which "are not sufficient to meet the running costs to-day under the present abnormal conditions" and which, of course, do not by any means cover the whole of the heat requirements of the normal household. Mr. Robert Fife dealt briefly with domestic gas appliances. The combination of coke and gas can look all competitors in the face given a fair field and no favour, though it remains true that the full benefits of carbonization cannot be secured until good modern appliances for gas and coke are installed in every house, old and new, and adequate insulation and good building standards become practicable. Finally, Mr. A. Bujnowski summarized his wide experience in the industrial use of town gas in Glasgow. One of the most remarkable developments mentioned was that of the tunnel oven, to the efficiency and great adaptability of which in the ceramic industry Mr. J. E. Stanier has recently called attention. In practically every industrial demand for heat which demands precision of control and of atmosphere gas has no technical rival and often its comparatively high fuel cost is far outweighed by its cleanliness and convenience in application and, above all, by its elimination of "wasters."

"FIELD'S" ANALYSIS

WE have pleasure in calling attention to the publication of "Field's" Analysis of the accounts of the principal gas undertakings for the year 1945. During the war years the publication of the Analysis was suspended and it is with interest that we approach the task of commenting on the present issue. The first thing which strikes us is that the compilers have made considerable changes in the arrangement of the items and have introduced new and noteworthy features. The Analysis is divided into two main parts, the first containing information relating to company undertakings and the second containing similar information for local authority undertakings. Each part consists of three sections; the first contains particulars of share and loan capital, dividend control, particulars of capital employed in fixed and long-term assets, followed by a complete analysis of the revenue accounts in summarized form. This summary is followed in the second section by a series of schedules showing the details of each main heading, while the third section is devoted entirely to statistics, the scope of which has been expanded considerably.

The form of presentation of the financial side of the Analysis is that recommended by a panel of accountants set up in the London area. This form has been adopted by a number of companies in order that their accounts may be strictly comparable; the contents of each heading have been carefully defined in detail. The task of the compilers has been simplified in the case of those company undertakings who have adopted the recommended form, but it must have been necessary to carry out a certain amount of adjustment with the other accounts. The knowledge of the wide differences in accounting practice has led the compilers to exclude the "all undertakings" totals, though it may be true to say that the published totals of the expenditure groups "Manufacture of gas (net)" and, perhaps to a slightly lesser extent, "Distribution" are reasonably comparable. When the schedules are examined it is only necessary to look at some of the costs per therm to see that accounting practice must surely account for some of the divergence. Another reason for divergence is, of course, that of the "divisor" to arrive at a cost "per therm sold." The "divisor" used throughout the Analysis represents the "total charged for," which is the aggregate of the therms sold to consumers, in bulk, and to processes, and is detailed. Here again it is noticeable that the treatment of benzole therms is not on a uniform basis. Some undertakings take credit for benzole therms as a sale of gas to sundry processes, but others, including the majority of local authority undertakings, make no charge to benzole account for the gas "lost," and the compilers have in such cases introduced an item under "Gas used on Works," which they describe as "Benzole therms not charged." The "divisor" will always present a problem, except in a very detailed form of analysis with a fairly rigid form of accounting practice, since the gas charged-for represents a wide range of commercial methods from direct manufacture to purchased gas passing through a main direct from the producer to the consumer.

Our congratulations go to the Editors, Mr. S. H. Collins and Mr. O. W. Wells, and their staff of assistants on the able manner in which they have tackled a very difficult task. The reconstruction of the Analysis undoubtedly enhances its value as a work of reference, and we have no hesitation in recommending it to those who wish to keep in touch with facts and figures relating to the Industry. The Analysis is now on sale and can be obtained from the publishers, Eden, Fisher & Co., Ltd., 6-8, Clements Lane, London, E.C.4, at the pre-war price of two guineas.

A BUILDING FUND APPEAL

IN the "JOURNAL" of October 23 last, reporting the Annual Reception of the Institute of Fuel, we recorded the announcement made on that occasion by Sir Ernest Smith to the effect that the Institute had, as he put it, "achieved one of its greatest objectives for the moment"—the acquisition of a really fine building suitable for the Institute. The new National Headquarters are at No. 18, Devonshire Street, London, W.1, and their acquisition has been made possible through the generosity of one of the Institute's Collective members, who bought the lease on the Institute's behalf for £21,400, the Council having promised to find this amount as soon as possible. Situated between Harley Street and Portland Place the new Headquarters are among buildings

in the immediate district devoted to professional and institutional use—for example, the Royal Institute of British Architects and the Institute of Petroleum—and altogether the dignified building, pictured elsewhere in our issue to-day, with its members' room, committee room, reading room, library, council chamber, and accommodation for editorial staff and the accounts department, is a fitting home for a Chartered national body which, since 1938, has increased its membership from just over a thousand to more than three thousand, the while setting up specific qualifications for admission to corporate membership and establishing an Education Scheme in fuel technology. It will be readily agreed that this is a remarkable record of achievement, and we have no doubt that possession of permanent and appropriate Headquarters will enable the Institute to play its part still more effectively.

Now the Institute has launched a "Building Fund Appeal," to the amount—including a sum for minimum decorations, alterations, and furnishing—of £25,000. Before launching this appeal nearly £9,000 had been received, contributions being forthcoming not only from individual members but from a wide range of supporters in solid fuel, gas, oil, and electricity operating and engineering industries. The initiative and drive shown by the Institute of Fuel are wholly admirable and, we are sure, are fully deserving of stout backing. The Gas Industry has gained much through the Institute's activities; in the future it is likely to gain more and in many ways. Hence we endorse the Institute's imaginative and courageous policy and believe that gas undertakings, company and municipally controlled alike, will lend their practical support. Such support has already been given by several gas undertakings and by manufacturers of gas making and gas using plant and equipment. This lead is one which others could follow to common advantage. As we go to press we learn that the sum so far subscribed amounts to £9,800; it now remains to fill the gap of £15,200. Not an unduly optimistic target to be reached by November 11 next.

Personal

Mr. JAMES JAMIESON, former Engineer and Manager, Edinburgh Gas Department, was recently presented with a clock by Mr. J. Doran, President of the Gas Department's Bowling Club, in recognition of his services on behalf of the Club.

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At the American Embassy on May 1, Mr. J. DAVIDSON PRATT, C.B.E., Director and Secretary of the Association of British Chemical Manufacturers, was awarded by the American Government the Medal of Freedom with silver palms for exceptionally meritorious work and co-operation with the United States while Controller of Chemical Defence Development at the Ministry of Supply from 1940 to 1945.

* * *

Mr. HAROLD WILLIAMS, O.B.E., F.S.I., senior partner in the firm of Harold Williams and Partners, has been elected Deputy Chairman of the Croydon Gas Company in succession to Mr. Henry Woodall, whose retirement was recently announced. Mr. Williams joined the Board in 1924 and has been Chairman of the Finance Committee of the Directors since 1932. A Fellow of the Royal Institution of Chartered Surveyors and of the Auctioneers' and Estate Agents' Institute, and a Member of the Town Planning Institute, Mr. Williams is also Surveyor to the Whitgift Foundation and other Croydon charities.

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A Message of Thanks

Shortly before his sailing last week to Johannesburg, after a visit to Europe, we had an interesting conversation with Mr. J. G. CURNOW, Engineer and Manager of Johannesburg's Gas Undertaking, an editorial comment on the progress of which we made in our issue of March 19, when we said that the rapid extension of the Undertaking since 1928 is perhaps unique in the history of the Gas Industry. After enjoying the sunshine and warmth of South Africa, Mr. Curnow arrived at Southampton on Feb. 21 to face the British Arctic ordeal. Shivering but non-plussed, he faced a strenuous and exacting itinerary. His spare moments must have been few indeed.

He has asked us, through our columns, to express his warm thanks for the hospitality extended to him and the kindness shown throughout his exhaustive, though wholly enjoyable, visit to the British Isles, Ireland, France, Belgium, and Holland. We accede most readily to his request, and in doing so record briefly and seriatim the visits to gas-works and the works of manufacturers of gas plant and equipment. He was able to inspect, during his intensive tour, first in London, at Nine Elms, the works of the Gas Light and Coke Company, then the gas-works at High Wycombe, Slough, and the East Greenwich Station of the South Metropolitan Gas Company. This first phase included a visit to the works of Smith Meters, Ltd. Thence to Birmingham, to the Corporation gas-works, and to the works of Radiation, Ltd., and of W. Parkinson & Co. Inspection of the gas-works in Manchester and Liverpool followed, and the next step was to W. C. Holmes & Co., Ltd., at Huddersfield, and to Oldham, where Mr. Curnow saw the factories of J. & J. Braddock.

And then to Dublin, Belfast, Glasgow, Edinburgh, the gas-works at which cities he visited, and, in Edinburgh, also the works of Alder & Mackay, Ltd. Whirled to Newcastle, Darlington, Stockton-on-Tees, to the works of Whessoe, Ltd.; and other visits included the works of Ashmore, Benson, Pease and Co., Ltd., and the tar distillation works of Norman Long at Middlesbrough.

A return to London, a shave and brush-up, and then to the Continent, to view at close hand gas practice in Paris, Brussels, and Rotterdam. The tour was finalized by inspection of the Veritas works of Falk, Stadelmann & Co., and hearing in the House of Commons a debate on the Nationalization of Railways.

Mr. Curnow told us how greatly he had been impressed by the British Gas Industry, and how greatly he appreciated the kindness showered upon him from all sides during a memorable, if climatically cold, visit to the "Old Country."

Obituary

THOMAS HARDIE

The Gas Industry has lost another of its outstanding personalities by the death on April 20 of Mr. Thomas Hardie, at the age of 76. Like many of his contemporaries Mr. Hardie was born into the Industry, for he was the son of the late Mr. William Hardie, for 42 years Secretary and later General Manager of the Newcastle-upon-Tyne and Gateshead Gas Company. He served his apprenticeship with John Abbott and Co., Ltd., General Engineers, Gateshead, having previously spent two years at the Durham College of Science, where he obtained the title of Associate of Science. For a short period he acted as Assistant to his brother, the late Mr. William Hardie, who was Engineer of the Tynemouth Gas Company.

In 1896 Mr. Hardie was appointed Assistant Manager at the Redheugh works of the Newcastle and Gateshead Gas Company, at which time Mr. V. Wyatt, of London, was Consulting Engineer. Three years later he became Manager at the Redheugh works, by which time Mr. W. Doig Gibb had become Chief Engineer of the Company. When Mr. Doig Gibb left Newcastle in 1909 to take up the position of Chief Engineer of the South Metropolitan Gas Company, Mr. Hardie was appointed to the senior position at Newcastle. He was President of the North of England Gas Managers' Association in 1906. For some time after its formation Mr. Hardie was Vice-Chairman of the Federation of Gas Employers, and he was also Chairman of the Northern District Committee and Chairman of the Northern Regional Joint Industrial Council for the Gas Industry.

He came to London in 1920 and joined the staff of the Gas Light and Coke Company, and in 1921 he entered on the duties of Deputy Chief Engineer and Engineer of the Bromley Station. On the retirement of the late Mr. Thomas Goulden in January, 1922, Mr. Hardie was appointed Chief Engineer, and in that year the Institution of Gas Engineers conferred on him the highest honour they could bestow by electing him as President. In 1927 he was elected President of the Southern Association of Gas Engineers and Managers. Following the death of Mr. Goulden in 1935, Mr. Hardie was elected a Director of the Gas Light and Coke Company. He had also been for several years up to the time of his death a Director of the Tottenham and District Gas Company. Among his many other distinctions he was a Member of the Institution of Civil Engineers and a Fellow of the Institute of Fuel.

Mr. **Michael Milne-Watson**, Governor of the Gas Light and Coke Company, writes:—

Thomas Hardie came to the Gas Light and Coke Company early in 1921 as deputy to the late Mr. Thomas Goulden, then Chief Engineer, at a very difficult time when the Company was struggling with the aftermath of the first world war; he was made Chief Engineer when Mr. Goulden joined the Court in 1922 and on the death of Mr. Goulden in 1935 he gave up the Chief Engineership to follow him as a Director. During his term of office he revolutionized the Company's production of gas; it was put on a highly scientific basis, every advantage being taken of

research, and the immense reconstruction works which under him were initiated and carried through brought the manufacturing side of the Company up to a very high standard. He introduced the large coal unloading plant at Beckton which was opened by H.M. King George V in 1926 and afterwards remodelled all the Company's coal and coke handling plant. He was responsible for the introduction of some of the largest vertical retort houses in the country, and, perhaps the peak of his achievement, built the two batteries of coke ovens at Beckton which are still model carbonizing plants. Apart from his great experience and capacity as an engineer, Mr. Hardie was a lovable man of high integrity held in affection and respect by all regardless of rank. As a Director he gained the confidence of all his colleagues and was a tower of strength to my late father; there was a firm bond of mutual regard between the two men. Those of the younger generation, like myself, learned to love and admire him; he was approachable and no problem of ours was too small or too great to gain his kindly attention and his shrewd advice and help. His outlook on life was steady, truly he was "a man upright and steadfast of purpose." I voice the feelings of my fellow Directors in saying that we mourn the passing of a great man and a good friend.

Mr. **John Terrace,** Hon. Secretary of the Institution of Gas Engineers, writes:

Thomas Hardie was born in the Gas Industry and served its interests with success over a period of many years. It was during the time that he was Engineer at the Redheugh works of the Newcastle and Gateshead Gas Company, however, that the writer became intimately acquainted with him and got to know his sterling worth and ability which was later to show itself when he was appointed Chief Engineer of the Gas Light and Coke Company. His introduction of vertical retorts, waterless gasholders and carbonization in coke ovens are a few of the outstanding changes which he made and these contributed in no small degree to the success of the Company; but it was his genial and sympathetic manner of handling his many assistants and problems that established him as the successful administrator he proved to be. On his retirement he joined the Court of Directors and when later the South Eastern Gas Corporation absorbed a large number of the gas-works in the outlying districts he performed a valuable liaison with the managers of the works which had been taken over and endeared himself to them by regular visits and sympathetic consideration of their problems. He was also made a Director of the Tottenham and District Gas Company where his valuable experience and help were greatly appreciated. He joined the Institution of Gas Engineers in 1905 and became President in 1921-22, and during his long association and service on its various Committees perhaps the outstanding work was when as Chairman of the Joint Research Committee of the Institution and Leeds University he made regular visits to the Livesey Professor at Leeds. As one who frequently made the visit to Leeds with him and greatly enjoyed the talk while travelling in the train and the visits to the laboratories the writer got a further insight into the quiet and unobtrusive way in which he handled difficulties and accomplished much real useful work.

Letter to the Editor

Cooker Height

DEAR SIR,—Miss Maywen Godby recently advised the London and Southern District Junior Gas Association that 33 in. would be a more suitable standard of height for cookers and kitchen furniture than the present 36 in. That the point is of general interest was shown by the fact that the *Daily Express*, in its issue for April 26, made a special feature of it under one heading "Cooking—to Measure."

I am in entire agreement with Miss Godby. It may interest you to know that her opinion is amply supported by the results of an enquiry held by the South Metropolitan Gas Company in 1943. For the purposes of the enquiry three demonstration hot-plates were installed in the Company's showrooms, their heights from the floor being 2 ft. 8 in., 2 ft. 10 in., and 3 ft. respectively. Women attending demonstrations were asked to record a vote for the height they considered most convenient, and 400 recorded their preferences as follows:

Height of Cooker	2 ft. 8 in.	67	=	16.75%
Height of cooker	2 ft. 10 in.	286	=	71.50%
Height of cooker	3 ft. 0 in.	47	=	11.75%

I think you will agree that there can be no ambiguity as to which is the most popular height.

Yours faithfully,
DEAN CHANDLER.

South Metropolitan Gas Company,
709, Old Kent Road, S.E.15.
April 30, 1947.

News in Brief

Tyldesley (Lancs) Gas Department has acquired premises in Wareing Street, Tyldesley, for use as a showroom.

Leamington Priors Gas Company has announced that owing to continued increases in the cost of production, the Ministry of Fuel and Power has authorized an increase in the price of gas of 1d. per therm, or 4½d. per 1,000 cu.ft.

Provost G. Bruce told St. Andrews Town Council that the re-imposition of purchase tax on gas cookers would add £1,000 to the cost of the 102 houses for which plans have been approved. The Council is to protest to the Department of Health.

The Last of the Winter Series of five evening lectures to Showroom Staff and Gas Fitters of the Leamington Priors Gas Company, was given last week at the showrooms by Mr. C. S. Rolls of Radiation, Ltd., who dealt principally with the trend in appliance design, particularly in domestic appliances.

Trade Statistics for December, 1946, just issued by the Department of Industry and Commerce in Eire, show imports of 17,413 tons of gas coal, valued at £52,165, as against 17,532 tons, valued at £50,603 in December, 1945. This brings the total of these imports for 1946 to 262,934 tons, valued at £775,937, as against 205,612 tons, valued at £582,632 in 1945.

The Annual Dinner of the Illuminating Engineering Society, revived for the first time since the war, will take place on May 14, at Grosvenor House, Park Lane, London, W.1, at 6.30 p.m. The President, Mr. J. S. Dow, will preside and the toast of the Society will be proposed by the Rt. Hon. Lord Marley, D.S.C., Chairman of the Colour and Lighting in Industry Council, and Dr. Charles Hill will respond to the toast of the Guests.

Bradford Gas Department is having installed at the Birkshall works a new water gas plant with a production of 2,500,000 cu.ft. per day, to be ready for service in January, 1949. At a cost of £53,000, it will embody all the latest improvements and will have a revolving grate for the disposal of clinkers, which on the present water gas plant is dealt with by hand. The new plant will increase the potential production of gas at the works to 17,000,000 cu.ft. per day. Demand has already exceeded 12,000,000 cu.ft. on a day at the emergency reduced pressure.

Gas Charges at Mansfield are to be increased to meet rising costs, subject to the approval of the Ministry of Fuel and Power. The rate of slot consumers is to be raised from 3s. 6d. to 3s. 9d. per 1,000 cu.ft. and there will be additions to the prices applying to quarterly meters. The domestic quarterly scale, hitherto ranging from 3s. 5d. to 3s. 1d. per 1,000 cu.ft., according to amount used, will be from 3s. 9d. to 3s. 5d.; the industrial rate, now 3s. 2d. to 2s. 6d., will be 3s. 6d. to 2s. 6d.; and the charges for central heating, at present 2s. to 1s., will be 2s. 6d. to 1s. 9d.

Diary

May 9.—Manchester District Association of Gas Engineers: Annual Meeting and Luncheon, Midland Hotel, Manchester,

May 9.—North of England Gas Managers' Association: Annual General Meeting, County Hotel, Newcastle, 2.15 p.m. Address by Dr. E. V. Evans, O.B.E.

May 12.—Women's Gas Council: Executive Committee, 1 p.m. at Gas Industry House.

May 13.—National Federation of Gas Coke Associations: General Committee, 10 a.m., Gas Industry House.

May 16.—London and Southern District Junior Gas Association: Annual General Business Meeting. Gas Industry House, 7 p.m.

May 19.—London and Counties Coke Association: Finance Committee, 11 a.m.; Executive Committee, 11.30 a.m.; Central Committee, 1.30 p.m.; Gas Industry House.

May 20.—Southern Association of Gas Engineers and Managers: Annual General Meeting.

May 21.—Wales and Monmouthshire Association of Gas Engineers and Managers: Annual Meeting, Engineers' Institute, Cardiff, 10.30 a.m.

May 22-23.—Eastern Association of Gas Engineers and Managers: Spring Meeting, Chelmsford.

May 28.—Manchester and District Junior Gas Association and Yorkshire Junior Gas Association: Joint morning visit to Warrington Gas Department; afternoon visit to the works of the Richmonds Gas Stove Co., Ltd.

May 30.—Women's Gas Council: Annual General Meeting, 3 p.m. Gas Industry House.

June 9.—London and Counties Coke Association: Technical Committee, 2.30 p.m., Gas Industry House.

Eastern Association

An attractive programme has been arranged for the Annual General Meeting of the Eastern Association of Gas Engineers and Managers at Chelmsford on May 22 and 23, under the presidency of Mr. F. N. Howes.

The annual golf competitions for the Turner Challenge Trophy and the George Wright Cup will be played over the course of the Chelmsford Golf Club on the Thursday afternoon, and in the evening, at Cannons Restaurant, there will be a reception by the Mayor and Mayoress (Alderman and Mrs. A. W. Andrews) and the President and Mrs. Howes.

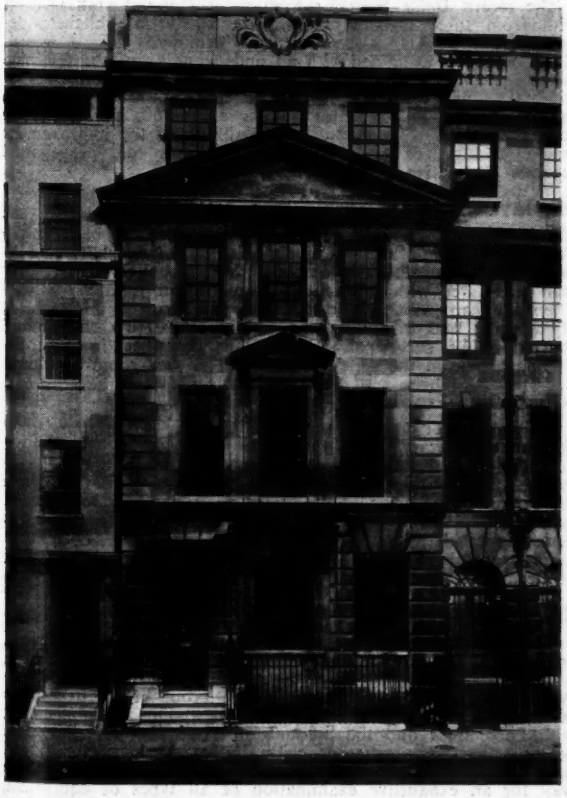
The business meeting will be held at 10 a.m. on the Friday, in the Council Chamber, and the routine business will be followed by a Paper on "Practical Progress in Water Treatment" by Mr. P. Wedgwood, and "Question Time," a feature that proved very popular at last year's meeting at Cambridge. For the ladies there will be a conducted tour of the Cathedral. Members, ladies, and guests will proceed by coach for the annual luncheon at The Chase, Ingatestone.

New Wage Agreement

At a conference at Gas Industry House, on April 30, between representatives of the Federation of Gas Employers and the Confederation of Shipbuilding and Engineering Unions, agreement was reached on wages and conditions of service (including two weeks annual holiday with pay, plus statutory holidays and the benefits of the Gas Industry Sick Pay Scheme), to apply nationally for skilled maintenance craftsmen.

The agreement provides for a working week of 44 hours over 5½ days, and establishes wages for skilled maintenance craftsmen in London at 3s. an hour and in gas undertakings in the rest of the country at 2s. 9d. and 2s. 8d. an hour, according to the size of the undertaking.

It was also agreed that lesser skilled operatives not covered by the agreements of the National Joint Industrial Council for the Gas Industry would also participate in the Agreement with respect to hours and conditions of service, and their rates will be discussed, and when settled, will be paid retrospectively to the date of the operation of this Agreement, which will be as from May 5.



New Headquarters of the Institute of Fuel. (*See Editorial Comment, page* 278.)

Manpower and Coal Production

More Money: Less Output

The accompanying graph (Fig. 1), prepared from figures taken from the "Colliery Year Book" and from the *Colliery Guardian*, shows the quantity of coal produced and the wages paid per shift per man during the years 1914-1946. To our mind there is much significance in the intersection of the curves relating to

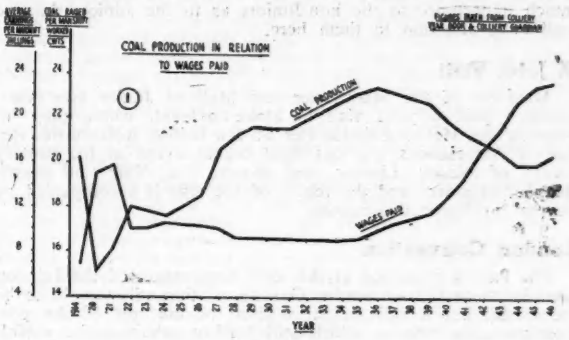


Fig. 1.

coal production and wages paid as indicated for the year 1942. At this stage we have an average earning per manshift of 18s. (equivalent figure for 1914, 7s.) and a figure of coal raised per manshift worked of 21 cwt. (equivalent figure for 1914, a little over 20 cwt.). After 1942, wages earned show a steep rise as indicated, accompanied, though, with a marked drop in coal raised per manshift worked. The picture, indeed, is not a happy one; and it indicates that beyond a certain limit high wages do not stimulate production in the coalfields. Are we to deduce that the best and most rational way of remunerating the miner would be to pay him a basic wage for production at the level indicated by the intersection of the curves providing he produces the amount of coal corresponding to this point of intersection, and to pay him less below this point in relation to his production, and—on the other hand, to remunerate him with a bonus according to his increased output above this basic point? We can quite understand that certain complexities due to local conditions and circumstances might have to be taken into consideration but suggest that there is logic in the idea put forward. We are indebted to the Severn Valley Gas Corporation, Ltd., for the diagram, which was prepared by Mr. G. M. Gill.

1947 "Journal" Directory

In order to keep the Directory information up to date, the following alterations and correction which have been notified during the past month should be noted in the 1947 issue of the "JOURNAL" Calendar and Directory.

Page 16 BRITISH GAS LIGHT.—F. T. Brookes, *S.*, vice, A. J. Mumford, retired.
„ 16 BRIGHTON, HOVE AND WORTHING.—P. E. Browne, *M.D.*, retired.
„ 84 YORK, HARROGATE &C.—F. W. Allum, *S.* and *Asst.G.M*
„ 90 EDINBURGH.—D. Beavis, *Dep. E. and M.*, vice D. D. Melvin.
„ 141 IMPERIAL CONTINENTAL GAS.—E. F. Dadson resigned *M.D.*, re-appt. *G.M.*
„ 141 BOMBAY.—London Office: Broad Street House, 54, Old Broad Street, E.C.2.

It was Announced in the early part of 1946 that the Institution of Mechanical Engineers and the Institution of Automobile Engineers were considering an amalgamation and that the application for the necessary powers had been made to the Privy Council. Authority has now been given by the Privy Council, and the Appointed Day for the amalgamation was April 13, On that day, the Institution of Mechanical Engineers, under the powers recently granted, created an Automobile Division to focus its activities in respect of automobile engineering, and also on that day an Agreement between the two Institutions came into force whereby the corporate members of the Institution of Automobile Engineers became corporate members of the Institution of Mechanical Engineers in appropriate classes, and simultaneously were placed on the register of its Automobile Division as the first members on the register.

Junior Activities

ALTHOUGH the diary of forthcoming events is inevitably shortening with the approach of the summer recess, the sayings and doings of the Junior Gas Association as recorded in "GAS" are far from fading in interest. The May issue, which still leaves some of the best Papers of the session to be published at a later date, covers a variety of subjects that call for further study. It is because we feel they are of as much importance to the non-Juniors as to the Juniors that we call brief attention to them here.

A Joint Visit

Members of the Manchester and Midland Junior Gas Associations paid a joint visit to Stoke-on-Trent, where they inspected the Mellor Laboratories of the British Refractories Research Associations and gas fired tunnel ovens at the pottery works of Alcock, Lindley, and Bloore, Ltd. Our staff photographer attended, and the report of the visit is accompanied by several exclusive illustrations.

London Convention

The Papers presented at the 1947 Convention of the London and Southern District Junior Gas Association still remain to be published, but a full report is given of the rest of the proceedings at a meeting which still further enhances the usefulness and prestige of the Association. It includes an account of the visit to the works of the Wandsworth and District Gas Company, where the members were welcomed by Colonel C. M. Croft.

Corrosion on Gas-Works

A paper by A. J. Brandram to the Manchester and District Junior Gas Association on "Corrosion on Gas-Works" is quite a treatise on this ever-present problem. Starting with the obvious statement that "some knowledge of the principles of corrosion is desirable" the Author deals first with the theory of corrosion and corrosive conditions in practice and passes on to the necessary qualities in materials of construction, the procedure involved in the preparation of metal surfaces, the selection of protective coatings, and the relationship between design and construction and the incidence of corrosion. The battle against corrosion, he says, begins in the drawing office. There is a bibliography of 44 references.

Meaning of Education

Discussing "What do we mean by Education?" Dr. W. T. K. Braunholtz, Secretary of the Institution of Gas Engineers, in a Paper to the Manchester and District Junior Gas Association emphasizes that education and vocational training are complementary. However well educated culturally, an engineer cannot go far in his profession without technical knowledge and proficiency; it is equally true that however well qualified technically, he cannot achieve maximum status and usefulness in his profession without a broad background of general education. In that broad background, Dr. Braunholtz goes far beyond mere book learning and indicates the values of music, art, films, sport, and physical exercise, for all of which, even in these days of high pressure work and study, time can be found if one's life is properly planned. "Let the student," he suggests, "set aside certain times in the week, for example, Saturday afternoon and evening and Sundays, when he will forget his courses and his classes and will take the recreation, mental and physical, which is essential to a healthy and balanced life." It is a Paper that every junior would do well to study, and judging from the length and quality of the discussion it provoked in Manchester it might well be discussed, even if only informally, in some of the other districts.

Supervisory Remote Control

Supervisory remote control equipment enables the nerve centre of a gas undertaking to perform with only two, or at most four, control wires the same functions as the direct control system employing scores of wires. It obviates the necessity for maintaining staff at stations where personal supervision is not necessary for 24 hours a day and where control operations are spasmodic; for example, the control of gasholder valves and governors. The equipment has the further advantage that, since it invests the authority to control in one individual—the control engineer on duty—it permits the use of semi-skilled or even unskilled labour in the outlying stations. There are many examples in the Gas Industry where its use would enable undertakings to dispense with the three-shift system, employing only day labour, which would be used for maintenance of the station or other routine duties. The wide field of application is detailed by H. R. Thomas, of the Automatic Telephone and Electric Co., Ltd., in a Paper to the Scottish Junior Gas Association (Western District).

"Gas Service" Presents:

In spite of surrounding gloom "GAS SERVICE" maintains its bright and vigorous air. "Selling in reverse" has never left our contemporary and trusted ally without its own wit and its own wisdom. As a thought-provoker, the May issue is not unique. Without blush on our cheeks we call attention in the following few words to some of the merits of the articles it contains within its pages—not forgetting the proceedings at the various Salesmen's Circles throughout the British Isles.

The Editorial View

Research into fuel economy is making great strides, the greater because of the urgency of the present situation and the recent crippling shortages. At Watson House the "back-room boys" are devising new appliances to combat the waste of our precious possession in obsolete heating methods and to prove that the correct usage of gas and coke is the only salvation for a country whose production is constantly threatened by dwindling fuel stocks. Is this knowledge being put to good use, and is the proven worth of these methods influencing the planners and builders of to-day's and to-morrow's houses? We think not, and it is with this vital problem that the editorial columns are concerned, discussing a recent Paper by G. C. Holliday which deplores the misplaced confidence in electricity displayed by certain local authorities and architectural designers.

Gas Fitting

The City and Guilds Course in Gas Fitting has been shortened and now lasts for four years instead of five, having two examinations instead of the original three. At the end of the second year students will take the Intermediate Grade and, as formerly, the Final Grade will be taken at the conclusion of the Course. Students will again be required to attend two evenings per week for the theory and practice of gas fitting, but if a third evening is devoted to certain specified ancillary subjects, a successful student will be awarded a City and Guilds Full Technological Certificate. The advantages of this Certificate and an outline of the Course is given by R. N. Le Fevre, Training and Education Officer of the Gas Light and Coke Company, together with other information on the new arrangement and its benefits.

Modern Homes

The recent *Daily Herald* exhibition at Dorland Hall is dealt with from three distinct angles. The convertible kitchen, designed by Mrs. Darcy Braddell and exhibited by the British Gas Council, is examined with an understanding of the feminine viewpoint and the implications of such a design to the housewife. The playlets arranged by the B.G.C. and performed in the "Womansense" Theatre at the exhibition, are not only described and illustrated, but the possibility of the improvement and circulation of such an attractive form of propaganda receives speculative editorial comment.

Display

To say that the copy for a window display, bearing the slogan, description and price, should be visible, short and to the point is to state the obvious. Yet, although any display man will agree with this rule, how many put it into practice? There are many subtleties born of long experience in this problem of catching and informing the public eye. How the desired effect may be successfully achieved is described in the concluding article in the series entitled, "The Showroom Window."

Salesmen's Problems

Believing that "most salesmen fail through laying stress upon immediate sales rather than permanent results," C. B. Church, in a Paper to the South Wales and Monmouthshire Gas Salesmen's Circle, considers the ticklish problem of sales talk and the correct presentation of gas-versus-electricity costs to potential consumers. Two-part tariffs and hire-purchase are subjects deserving much attention at the present time and Mr. Church turns over all the stones—not forgetting the financial working of the maintenance system.

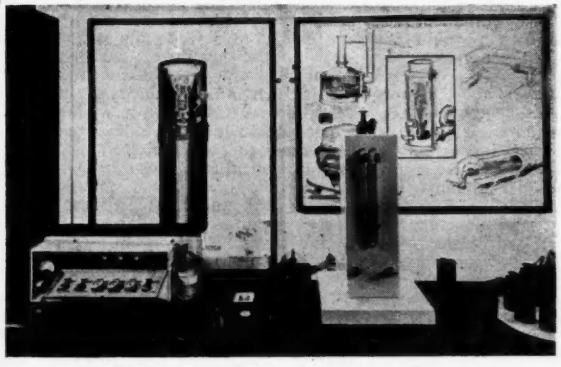
Kitchen Equipment

The planning and equipping of kitchens for hotels, hospitals, and the like, is a subject for the specialist. In his Paper, "Large Scale Kitchen Equipment," presented to the South-Western Circle, J. P. Nott gives ample proof of his experience of catering from the gas engineer's viewpoint. Commencing with floor areas and the amount of space necessary for each person, the Paper proceeds naturally to kitchen layout and design. This is dealt with in considerable detail and paves the way for an exhaustive examination of all types of equipment, including ranges, bains marie, roasting ovens, boiling tables, fish frying ranges, steaming ovens, boiling pans, stockpot stands, hot closets, etc.

Physical Society's Exhibition

AN event of importance in the scientific world took place when the 31st annual exhibition of the Physical Society was held, for the four days commencing April 9, at Imperial College, Imperial Institute Road, S.W.7. Without doubt the most notable feature of the exhibition was the evidence of increased use of electrical and electronic appliances in industry—and in this the Gas Industry was shown to be no exception.

Of the exhibits on the Gas Light and Coke Company stand, no fewer than four were of an electrical character. Perhaps the one most likely to affect workers in the Industry was an exhibit of relatively humble nature, a new type of electric torch, developed in conjunction with Oliver Pell Controls, Ltd., and the Varley Accumulator Company, for the use of meter readers. The torch will give a uniform light for eight hours after which the battery can be recharged. The construction is both ingenious and simple, being equipped with a positively locating switching dolly and slide and easily removable head. A simple method of measuring the heat passing up the flue of a gas appliance was demonstrated by means of an electrically-heated grid inserted in the flue which raised the temperature of the flue gases over a convenient range. The rise in temperature for a measured electrical heat input was compared with the initial temperature rise of the flue gas over the air entering the appliance; the initial heat in the flue gases could then be calculated by simple proportion. Another exhibit showed an electric spark ignition device which made it possible to ignite burners readily, especially those in relatively inaccessible positions. The type of McBain-Baker electro-magnetic balance used by Griffith and Marcom in their work on the magnetic properties of various iron oxides was also shown. Besides these essentially electrical appliances, the large non-bunsen type "Hypact"



Shown above are two of the exhibits on the Gas Light and Coke Company stand. On the left is the new type of industrial torch together with charging apparatus and, on the right, the large non-bunsen type "Hypact" burners.

burners were shown in operation. These burners (a new Watson House development) give a perfectly stable flame at all gas rates of 0.5 to 1,100 cu.ft./hr. at 3 p.s.i. Increasing use is being made of these in industry where high heat releases and compact flames are required. A high-temperature muffle furnace working on low-pressure gas with a natural draught was demonstrated. By means of increased insulation and by the use of a recuperating system, the furnace is capable of reaching a temperature of 1,450° C. in an extremely short time. Apparatus for determining the total air requirement of gas was demonstrated and the "calyx" described recently by Brinsley and Stephens, of Radiation, Ltd., was clearly visible. The critical air/gas ratio needed was measured with soap film meters.

New forms of the latter were also shown on the stand of Griffin and Tatlock, Ltd., where a complete apparatus was in operation rapidly analyzing coal gas. The apparatus was developed by W. J. Gooderham in the Fulham Research Laboratory of the Gas Light and Coke Company. Instead of a static form of gas analysis apparatus, gas is made to flow through a soap film gas meter, a reagent to remove one constituent, another gas meter, another reagent, and so on. The soap films can be readily stopped and measurements taken so that a complete gas analysis for carbon dioxide, unsaturated hydrocarbons, oxygen, hydrogen, carbon monoxide, methane, ethane or paraffin hydrocarbons and nitrogen can be obtained already in percentages in 2-3 minutes. The other "constant volume" gas analysis apparatus developed by the Gas Light and Coke Company was also to be seen in operation on the same stand.

Adjacent to the G.L.C. stand was that of the Research Laboratories of Ascot Gas Water Heaters, Ltd., which exhibited ignition velocity measurement apparatus, a micromanometer, and an infra red gas analyzer. The latter was built by the Infra Red Development Company and enables continuous readings of carbon monoxide concentrations, down to the lowest which are usually of interest, to be taken by an unskilled operator. The instrument, which is contained in two compact enamelled aluminium alloy cases and is operated from 200-250 V, 50 cycle, A.C. mains, can be used for many other gases. The apparatus for the measurement of rate of ignition along multiple jet gas burners uses two small platinum resistance elements in A.C. bridge circuits which are unbalanced as the flames impinge on the platinum wires. The out-of-balance voltages are amplified and made to operate relays, one to make the clock circuit and one to break it. A 500-cycle oscillator is used to minimize the possible half-cycle loss in the operation of the valve, and a twin-beam oscillograph is used for establishing the balance of the bridges, and photographically for checking the timing.

On the stand of Elliott Brothers (London), Ltd., a large selection of electrical instruments were on view. They included a high precision voltage transformer, a new design of miniature-type deflectional frequency indicator, a long-scale moving coil ammeter, a portable moving iron voltmeter, a reflecting galvanometer, and a miniature moving coil relay.

The Foster Instrument Co., Ltd., displayed an improved optical pyrometer of the balanced bridge disappearing filament type, a portable balanced-bridge air thermometer, a miniature portable Wheatstone bridge with three ranges, a cascade range electrical resistance thermometer recorder, a range of 12 selected thermo-couples, improved thermo-couple connecting heads, a high magnification introscope for cylinder bore examination, a long focus microscope and portable general purpose introscope.

Examples of impulse-sequence cycle and Free Vane controllers were among the considerable range of apparatus exhibited by Bristol's Instrument Co., Ltd. Also shown were varied types of recorders, recording thermometers, and the Metavane system of pneumatic telemetering.

Houseworkers' Institute

The National Institute of Houseworkers was opened by Mrs. Attlee on April 18, and last week, at the Mount Street Headquarters, the Chairman of the Board of Directors, Miss Dorothy M. Elliott, M.A., O.B.E., J.P., spoke on the work and aims of the Institute. She said that, based upon the recommendations of the Parliamentary White Paper known as the Markham-Hancock Report, the N.I.H. had been set up as an experiment the results of which should benefit both the housewife and the houseworker, ensuring for the one a well-trained and skilled employee, and for the other the best working conditions.

The primary object of the Institute is to raise the prestige of domestic work, to give it the status of a skilled craft and consequently to attract more workers. As a first step, the Institute will establish a Diploma for skilled domestic workers to rank with the diplomas of other professions. It will also give free training to houseworkers, issue its Diploma to other domestic workers not trained by the Institute, but able to fulfil the standards of its Examining Board, establish approved rates of wages and conditions of work, arrange for the placing of houseworkers, run a supply service of Associate Members for part-time help and maintain a research centre.

The course of training for women and girls over 18 will last six months and will cover housecraft and home budgeting, cooking, laundry work, crafts (including needlework and simple household repairs), health education and the care of children and old people. Training will be free, with the ordinary allowances paid for Government training schemes, and experimental centres are to be set up in various parts of the country.

The Institute has secured for its administrative headquarters a house in one of the most central parts of London, at 53, Mount Street, to be the focal point for the work and for all individuals and organizations, both at home and overseas, who will be interested in the Institute's work.

The members of the Board of Directors include a domestic worker, an ex-service woman (who is now the principal of a Domestic Science College), the managing director of a well-known hotel, and experts on rural problems, education, and specialized training. Mrs. Abbott, the General Secretary of the Women's Gas Council, serves on the Advisory Committee of the N.I.H.

It will be interesting to watch the development of this experiment, but it is to be hoped, after considering the high wage scale demanded by the Institute and its Mayfair address, that it is not going to fail in providing household help to those families where it is most urgently needed, but where the income level is not high. One cannot but feel that the prestige of domestic workers has risen automatically during the past few years, and that they are already able to command good salaries and living conditions, with or without a pale blue uniform and an Institute badge.

North British Association of Gas Managers

Presidential Address*

of

JAMES M. DOW, M.Inst.Gas E., Paisley.

(*Continued from p. 245*)

From a technical point of view there is much to commend such a scheme for the Gas Industry, and the sub-division of Scotland into three areas roughly corresponding to those proposed for the electricity industry would go a long way to overcoming the physical difficulties peculiar to the distribution of the country's population and industry.

I might suggest, however, that Scotland be allowed its own Central Authority, whose deliberations would be presided over by the Secretary of State, so that this Minister would at all times have his finger on the pulse of the Industry. This Central Authority would be responsible for correlating the work of the District Boards with the Central Board to be set up by the Ministry of Fuel and Power.

Before this advancement takes place, there is likely to be much heart-burning over the basis of compensation to be offered to the present owners of our undertakings. The fact that local authorities may receive no compensation other than being relieved of their liabilities and debts on their undertakings will create many anomalies likely to be disputed by those responsible for local government finance. One can foresee some difficulty arising over a local authority which by sound financial policy has written off its capital debt and maintained its undertaking from revenue and with ample reserve funds, receiving no compensation for its undertaking. In addition to receiving no compensation, the local authorities will lose the right to use (1) trading profits in relief of rates, (2) contributions to central establishment charges and other overhead expenses, and (3) the benefit of income tax set-off. To the gas engineer those matters have at some time caused concern, and, although he has appreciated the integrity with which such matters have been dealt with, there is a feeling, rightly or wrongly, that they cannot form a basis of a compensation claim if the real interests of the gas consumer are to be safeguarded. The gas undertaking, whether State or municipally owned, will remain one of the country's most valuable ratepayers, but it cannot afford to earn profits for the purpose of relieving the local rate burden of any particular community.

New Standards of Service

It is generally accepted that basic standards for gas manufacture and distribution are necessary obligations of the Industry in the formulation of national policy. National standards relating to the removal of sulphur, the maintenance of calorific values within narrower limits, and a limit in the variation of district pressures and specific gravity, are matters that have already been recognized as of first importance requiring early statutory revision. It is quite apparent that very few undertakings are in a position at the moment to deal effectively with these problems, but the revision of present standards is essential to any plan of regionalization. Although little has yet been written dealing with the re-planning of manufacturing stations, it has already been made abundantly clear that future changes will result in the closure of small and uneconomic stations and the considerable expansion of the large and efficient undertakings.

In Scotland, where there is a preponderance of the small undertakings, it has become clear from the data collected by the Gas Engineering Advisory Board that the most efficient plants are not necessarily confined to the larger undertakings. In this connexion, is it fair to judge the efficiency of an undertaking entirely by its Fuel Expenditure Index? One cannot dissociate the efficiency of any undertaking from its balance-sheet, and the net cost of production must surely remain a better index when comparing one undertaking with another. Moreover, the selection of Gas Industry plant has to be considered very often from a geographical point of view. With the price of coal likely to remain at its present high level, and encouraged by the national need to conserve the country's coal resources, the obvious choice of the smaller undertakings is towards total gasification. The efficiency of two-stage or single-stage plants of this nature still leaves much to be desired, and has a decided bearing on the F.E.I. returns of the smaller undertakings operating such plant. Nevertheless, as the problem of coal conservation is likely to remain of primary importance for some time ahead, the change-over, even in the larger manufacturing stations, is likely to follow a much wider acceptance of complete gasification methods. Complete gasification by the methane synthesis or by high pressure methods may eventually be developed, and if such processes become commercial propositions, the Industry will undoubtedly change over in the main from a two-fuel to a single-fuel policy. If this happens, a complete revolution in existing gas production plant and practice will take place; and, as the technical skill of the gas engineer is likely to require very much more specialized knowledge, it is necessary to sort ourselves out into areas where production can be concentrated on sound economic lines. I am firmly of the opinion that it is only when the Industry has adopted a single-fuel policy that the new standards of service we would all like to see introduced as soon as possible will become effective. Integration of undertakings will help greatly towards this end, but standardization of such things as calorific value, specific gravity, &c., cannot really become effective until the Industry is relieved of its responsibilities of meeting a very unreliable coke market.

*Given at the Spring Meeting at Paisley on April 11.

The Coke Market

During the war years and the present fuel famine, we have been inclined to forget the difficulties once encountered in finding a suitable market for coke. The war years have seen a considerable step-up in coke production, especially on the coke oven side, and it may be with a view to absorbing expected surpluses, now that the major war industry markets no longer exist, that the Government is pursuing a smokeless fuel policy in the post-war housing of the country. There can be no denial of the fact that a smokeless Britain would prove a tremendous asset to the nation. The damage by smoke and soot to the health of the country is incalculable. With the diminishing output from the coal industry, however, and the ever-increasing demand by industry for superior fuels like gas and electricity, one must seriously consider where the material for this new smokeless age is to come from. The obvious answer is, surely, to cease the wasteful burning or raw coal for domestic purposes, and instead to process the 40 million tons per annum now consumed in this market. Industry can consume the poorer qualities of coal much more efficiently than the domestic grate. The better qualities of coal could then be processed by the coke oven and gas industries, producing a better quality of domestic coke, and using up any surplus to meet winter peak loads for gas. By this means the fuel processing industries might handle approximately 50% of Britain's annual coal production, as opposed to the present 20%. Moreover, the young and growing plastics industry would be provided with a most valuable increased source of raw material, so necessary for its successful development in this country. Proper development of this industry is bound to provide a more remunerative market for liquid by-products than at present exists, while at the same time the textile industry of the country would by new synthetic processes be encouraged to recapture its former world supremacy. It can safely be said that a ton of coal processed is worth twice its value than when sold as a fuel. This additional revenue would go a long way to alleviating the task of the miner, by paying for the introduction of modern mining machinery into the industry, thereby reducing the number of men required for the arduous underground task of winning coal, and making possible a more economic wage befitting the discomfiture of the task.

Fuel of the Future

The fact that the future of the coal industry is so much bound up with the ability to process coal, rather than exporting it as a raw material, means that the Gas Industry is destined to play an even greater part in the fuel industry of the future. Gas is an essential by-product of all fuel processing. Its value in the industrial field is already fully recognized by the industrialist. If, therefore, the return from its associated solid and liquid by-products can be kept sufficiently attractive to permit of its selling at a remunerative price to industry, its utilization for many of the heat-treatment processes developed during the war years is likely to be the beginning of greater development in the more staple industries of peace. To facilitate this development, continuous study must be given to improving the thermal efficiency of industrial processes, and this, coupled with efficient planning of practice inside the factory, opens a tremendous field for development for the use of town gas in industry. The industrialist, faced with the difficulty of the introduction of the five-day week, the shortage of certain types of labour, and the general demand for improved working conditions, together with a continuance of the comparatively high price for solid fuels, is more than likely to seek a fuel for his heat-treatment processes readily controllable and more adaptable to automatic methods of firing. In this field, gas vies with electricity and oil, and its adaptability and the fact that

it can be efficiently burned under practically every required condition gives it almost complete superiority over other fuels. The excellent work being done by the Industrial Development Committee of the British Gas Council through the Industrial Centres cannot be too highly commended, and the Industry owes much to those gentlemen who give so unsparingly of their time and experience in the preparation and dissemination of information so valuable to undertakings when dealing with enquiries in their particular districts.

The Gas Engineering Advisory Boards

Set up as a purely wartime measure under the mandate of the Institution of Gas Engineers, with a view to assisting with the Government's fuel conservation policy, the Regional Boards have done much good work in arousing a feeling of fuel consciousness among all undertakings.

As a nation, Scotland has always been resentful of any interference with its home affairs. Its industries are similarly national, and do not take kindly to direction or criticism. It would be idle to deny that some of us have resented the rights of our neighbours to tell us how to run our undertakings, but it is pleasing to note that with very few exceptions members of the District Boards have been made welcome in their efforts to make the best of a difficult task. It is gratifying to learn that there is a sincere desire for the continuation of the work of the District Boards now that peace has once more returned.

National Gas Organizations

This year has seen the incorporation of the British Gas Council. Many of us regret the passing of the British Commercial Gas Association as a separate entity. Its evolution during the early days of electrical competition, and the excellence of its work during the roaring 'twenties and the more strenuous 'thirties will remain a monument to the efforts of those pioneers who first saw the need for national direction of the Industry's advertising. How well this was accomplished needs no words of mine to express. The birth of Mr. Therm and his ultimate adoption by the public as a national celebrity is only one example of the excellence of the Industry's publicity. The absence of obnoxious claims over competitive fuels, coupled with the policy to keep the public informed purely on the development of gas matters, set a standard in national advertising that other national industries could well afford to study. We remain indebted to those gentlemen for their foresight in those matters, and trust that under the change in administration the quality of the Industry's propaganda will maintain its pride of place with public opinion. The work of the Domestic Development Committees has so far been most encouraging. The thoroughness with which they have tackled the needs of the housing problem of the nation has been of great service both to the Industry and to housing authorities in general. Already the general acceptance of recommendations covering major items of sales and service has borne fruit and given birth to a new confidence in our Industry. Much as we abhor the filling in of forms, it is readily realized that the assimilation of the information returned is a much more difficult task, and we have little reason to complain of the efforts made at headquarters to interpret those requisitions into a fair share out of the limited equipment available.

Nor must we forget the efforts of the Women's Gas Council to hold the interest of women's organizations in the domestic field. It is true that too few of the Scottish undertakings have made the fullest use of this service; yet those who have are enthusiastic about the results, and the excellent work of Dunfermline, Hawick, and Renfrew undertakings merits every commendation. Perhaps this coming year will see a greater effort being made to support those undertakings in a field which to most of us may have seemed a little beyond our ambit.

The Gas Engineers' National Guild

It would be discourteous not to refer to the good work of the Scottish Management Committee of the National Gas Organizations. We are indebted to its members for the time they give ungrudgingly in looking after our major interests. The safeguarding of our coal requirements, their recommendations on matters of national and local importance, the maintenance of the good relations between employers and employees, the interchange of information, so important in these days of Government direction, are only a few of the potent factors that help to bind the Scottish Gas Industry into that brotherhood so obviously apparent to the enquiring stranger. We have been described as the Cinderella of the public utility services—quite a charming title when we consider the potentialities. In our time we have faced much taunting and derision from our more favoured sister industry, but this has been the means of moulding a service which those who have sought have invariably found the best solution of their problem. We have not shouted about our successes; rather have we gone quietly about our business. This, then, is the secret of our success; and on such a foundation our Industry is bound to prosper.

I would be failing in my duty were I to exclude from this Address a reference to the Gas Industry's latest protégé. With the shadow of nationalization already across our path, it would be well for the gas engineer to pause for a moment to consider what his own position might be in the very near future. Most of us spend all our energies in the interests of our calling and have given little more than a passing thought to the physical welfare of ourselves or those for whom we are responsible. True, in most cases our employers have been sympathetic and encouraging, and under their personal direction we have been happy to place our trust; but our Industry is at the cross-roads, and we must see to it that our personnel are adequately protected against the dangers that lie ahead.

The formation of the Gas Engineers' National Guild has, therefore, not come too soon; indeed, there are many who consider such an organization long overdue. The Guild opens its door to all Chartered gas engineers and others suitably qualified, holding executive or technical positions in the Industry; but the door is not closed to younger members of the Industry, or to those who, through no fault of their own, have not yet become corporate members of the Institution of Gas Engineers.

Nothing in the Constitution of the Guild is of revolutionary character; but in these days of national negotiating machinery between employers and employees in organized industry, it is but right that the ranks should be closed to any form of exploitation. Membership, as far as has been disclosed, stands about the 600 mark; but it is doubtful if Scotland's representation exceeds 5% of this total. It is to be hoped that greater support will be forthcoming to our representative on the Interim Management Committee, so that the peculiar interests of our Scottish personnel can be properly protected. One thing we can be sure of under nationalization is that the appropriate Government Ministry will require to know what organization exists to negotiate salaries, pensions, compensation, &c.; and without the Guild the only alternative would be for the Ministry to make its own decisions. I am sure such a condition is far from being your mind on these important matters.

Research

I had the pleasure of attending for my first time the Autumn Research Meeting of the Institution of Gas Engineers in London in November of last year. The number attending from the Scottish undertakings was far from encouraging, and I must confess that, in spite of the fact that the meeting was, as usual, admirably organized and conducted, I completely failed to appreciate its value. This may have been due to the fact that the majority of the subjects discussed were entirely above my head, and, apart from one or two exceptions, bore little relationship to the everyday problems confronting the gas engineer in his efforts to provide a better service to the consumer. I do not blame the Director of Gas Research for the feeling of frustration that crept over me after listening to the learned deliberations of his research team, but I was forced to ask myself just how much of the information evolved I could apply to my own particular problems. I do not think I was alone in seeking the answer to this question. It is generally recognized that the true research worker is born—not made, and that our Industry probably does not attract the type of men we are looking for; but surely the members of the Gas Research Board can infuse a little less of the unreal into the choice of subject, and follow a humbler and more constructive course on problems that will evolve more factual knowledge on things more in keeping with the common touch.

Institution of Gas Engineers

I wonder how many of us realize how much we owe to the Institution of Gas Engineers for the strong position our Industry holds to-day. Truly it has been the "back-room" of our technological progress. Just how smoothly this nerve centre has worked is indeed a great tribute to its Secretary and his staff. The changes which nationalization will bring to our daily lives must not interfere with its function. The honour bestowed on this, our premier organization, by the granting of its Royal Charter in 1929, will be jealously guarded by everyone to whom it has extended the hand of fellowship. It has been my privilege to sit as your district representative on its Council of Management during the past year. I have been deeply impressed with the ability of my colleagues elected to that high office. They are a band of men whose sole object is for the welfare and advancement of our Industry. It is gratifying to note that Scotland is well represented on so many of the technical committees, and it is also pleasing to record that in this "parliament" no feeling of misguided nationalism exists. Rather is it the reverse: the Scot is made very welcome by his colleagues over the Border. He is given ample scope to make his point, and his opinion on any particular matter is weighed with patience and understanding.

Education

For some time now there has been agitation for modification in the Institution of Gas Engineers' Education Scheme. The return of serving members of the Forces to their peacetime employment, coupled with the Government's desire to see those men are given a proper chance to rehabilitate themselves, has

probably accelerated these matters. It is gratifying that the Industry, collaborating with the Ministries of Labour and National Service and of Education, has set in being refresher courses at Birmingham, Bournemouth, and Brighton. These and other measures have no direct bearing on the major alterations contemplated in the educational qualifications of the Chartered gas engineer. At an early date, the Ordinary, Higher Grade, and Diploma Examinations of the Institution of Gas Engineers will be replaced by a single examination for Associate Membership. This does not mean that ancillary subjects will no longer be required. On the contrary, candidates would first pass a common preliminary examination. The Associate Membership Examination will itself be in three parts—A, B, and C. Parts A and B will cover the fundamental engineering sciences. Students will normally spend three years over Part A, with a further two years over Part B. Part C will cover preparation for examination in the main subject of Gas Engineering (Manufacture), and may be expected to take a further two years.

Admittedly, the old scheme had many shortcomings; but the fact that it has weathered the storms of often inspired criticism from many who are now holding important executive posts in the Industry is ample proof of the sound planning of the original authors. We extend our unstinted admiration and thanks to Mr. John Terrace and his Committee, not forgetting our own founder member in the person of Mr. David Fulton, for their untiring efforts to bring the standard of the Educational qualifications of the gas engineer in line with those of the more "seeded" professions.

Before passing from education, I must make reference to the new scheme for the training and examination of salesmen. It should be the aim of everyone to qualify to the best of his ability in the profession of his calling. The Certificate in Gas Salesmanship and Consumers' Service is designed to serve the requirements of hundreds of men to be engaged on the sales side of the Industry, whose job in the post-war years will be to sell gas service in the widest sense.

In tackling these major problems, the members of the Education Committee have given a lead to the Industry, which augurs well for its future welfare, making a career in the Industry something really attractive to the youth of our country.

Steam Jet Blowers and Fans on Steam Boilers at Gas-Works

By R. L. GREAVES

Engineer and General Manager, St. Helens Gas Department

GAS engineers are considering whether the steam jet blowers on their boiler furnaces should be retained or if it would be more efficient to change over to fans for supplying the forced draught.

Having a range of four Lancashire boilers at St. Helens fitted with steam jet forced draught blowers we decided to convert one of them by installing an electric fan with suitable ducting and efficient control dampers.

The work was carried out without sensibly interfering with production, and from the results I am able to give it is clear that the change was justified financially and economically by a large saving in fuel, as well as by a corresponding improvement in the conditions of employment. The three remaining boilers are now being equipped in a similar manner.

The accompanying photograph shows the first boiler at our St. Helens Gas-Works so converted by the Chemical Engineering

and Wilton's Patent Furnace Company, Ltd., of Horsham, to whom the further contract has been given.

The economies directly attributable to the conversion can be compared with the following particulars of the two forced draught systems at St. Helens Gas-Works and relate to the three Lancashire boilers at work:—

Cost of Fuel only for Steam Jet F.D. System for 3 Lancashire boilers.
= £851 per 50 week year.

Cost of Electric Power only for Fan F.D. System for 3 Lancashire boilers.
= £84 per 50 week year.

Saving in cost by the Fan F.D. System over the Steam Jet System regarding fuel and electric power only = £767 per 50 week year for three boilers. Fuel Saved = 316 tons per 50 week year for three boilers.

In determining this saving in cost and fuel tonnage by the fan system, every possible advantage was given to the steam jet system; for instance, no allowance was made for the steam jets gradually enlarging, 20% deduction was allowed for the steam jets being shut down completely during blowing off periods, &c., and the figures were based on the high evaporation rating of 8 lb. of steam per lb. of fuel consumed. To the considerable saving in cost and fuel tonnage by the fan system, the saving in water softening agents, flue and scale deposit, must be added, and consideration given to the handling of less fuel and resultant ash.

It will be of interest to engineers to compare the two systems, and to study the main points relating to each and with this object in view I am obliged to Mr. T. G. Fegan, Combustion Engineer of the Wilton Company, for his co-operation in summarizing briefly the following advantages of each system:

Steam Jet Forced Draught.	Fan Forced Draught.
Simple and cheap to install.	More difficult and expensive to install.
No moving parts.	
Jets become enlarged unnoticed.	Motor or electricity may fail, but standby steam-jets are fitted and used solely as a safeguard against this.
Jets occasionally get partly or wholly blocked unnoticed.	
Noisy in operation.	Practically silent in operation.
Jets consume between 5% and 10% of the boiler's evaporation (according to the size of the jets, the steam pressure and the grade of fuel) to produce only a maximum of approximately ⅛ in. t.w.g. forced draught under the firebars.	Fan absorbs approximately 1 h.p. per Lancashire boiler to give ½ in. t.w.g. forced draught under the firebars. Higher draught possible if required.
Give least draught when the boiler pressure is low—namely, when it is wanted most.	Fan gives constant draught irrespective of the boiler pressure—namely, the maximum forced draught is available if the boiler pressure is low.
Steam from the jets assists in keeping the firebars cool and reducing heavy clinker.	Fan forced draught for burning coke breeze and coke requires hollow firebars of correct design to prevent firebars overheating and clinker trouble.
Large jets working on a low steam pressure are not as economical for draught production as smaller jets working on a higher pressure.	
The presence of excess steam in the furnace gases may cause pitting of the boiler plates and economizer tubes.	The saving of this same percentage in water, softening agent, flue and scale deposit, while the fireman has this amount less of fuel and its ash to handle.

The amount of steam being consumed by the steam jets (W) can be calculated from the formula (British Standard 878):—

$$W \text{ lb./min.} = \frac{6\ a\ p}{7}$$

where a = area in square inches of the jet bore,
p = absolute steam pressure on the jet in lb./sq. in.
which becomes:—1 lb. steam per hour = 51.42 × a.p.

The table below gives the steam consumption per jet for different sizes of steam-jets operating on various steam pressures:

Jet Bore.	Area of Jet Bore sq. in.	(Gauge) Steam Pressure 50 lb./sq. in.	75 lb./sq. in.	100 lb./sq. in.
3/32 in.	.007	23.26 lb./hr.	32.4 lb./hr.	41.48 lb./hr.
1/8 in.	.01227	40.76 ,,	56.8 ,,	72.70 ,,
7/64 in.	.02761	92.10 ,,	128.0 ,,	163.80 ,,

From the table it can be seen that with a Lancashire boiler burning coke breeze and evaporating, say, 5,000 lb. steam per hour, having ten steam jets each 3/32 in. diameter bore, with steam on the jets at 75 lb. pressure, the steam consumption of the jets will be 324 lb. per hour, representing approximately 6½% of the boiler's evaporation, or 54 lb. of fuel per hour (assuming 6 lb. water evaporated per pound of coke breeze).

The coke breeze at, say, 26s. per ton, the cost of running the steam jets would thus be 7½d. per hour.

Although this is a good steam-jet furnace case, by comparison the electric driven forced draught fan would produce a slightly higher forced draught when absorbing 1 h.p. per boiler and at ½d. per unit of electricity, would cost only ½d. per hour to run. Hence the fan forced draught system shows a saving over a year's work, say, 40 weeks continuous running, of £189.

Should the fuel used be coke or other similar expensive fuel, then the saving for 40 weeks continuous running would be in the region of £450, and considerably more if the steam jets were larger than the 3/32 in. diameter taken in the example, and/or if the steam pressure were more than the 75 lb./sq. in.

The fans for the forced draught are of the centrifugal type of the fully backward curved bladed (non-overloading) design, this being an important factor as the smaller and cheaper forward curved bladed (overloading) type have been found not only to overload the motor, but to increase the volume through less resistance caused by such as blow holes in the fires, thus seriously reducing the boiler efficiency.

The position for the fan and the layout for the ducting has been given the required careful consideration, and the fan placed as near to the boiler as possible to save undue friction losses in the air ducting.

The overhead air ducting of ample cross section area has been galvanized after manufacture and fitted with master damper and regulating dampers near each furnace.

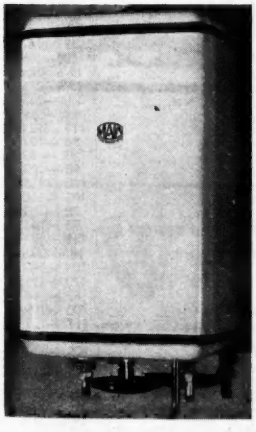
The new furnace equipment comprises robust cast iron air boxes to withstand rough usage, being of ample size for the air volume required, and the furnace firebars are of the hollow section lateral compartment type, with baffle plates ensuring equal air distribution over all sections of the grate; an added advantage is the firebrick tiled sloping end to the grate, as it enlarges the combustion chamber of the confined Lancashire boiler furnace tube and makes cleaning out quicker and easier.

The reason why steam jet forced draught system was so popular at gas-works prior to the recent war was on account of its simplicity and cheapness to install and because coke breeze and other fuels were both cheap and plentiful. To-day, the position is very different and it is not surprising to find many gas engineers contemplating fitting fan-operated forced draught furnaces in order to save money and help reduce the country's fuel consumption, and it is of interest to know that the Ministry of Fuel and Power has expressed its approval of the fan-operated system of forced draught.

A New Storage Water Heater

Main Water Heaters, Ltd., have introduced a new storage water heater—the Thermain No. 2. The appliance has, it is claimed, special features peculiar to itself, simplicity, robustness, speed with efficiency, and maintenance facilities.

Simplicity: The heater, with the necessary exception of ¾ in. gas and water connexions, is completely self-contained. It consists of a rectangular water vessel of tinned copper through which passes the non-condensing heat exchanger. Also inside the vessel, the thermostat element is enclosed in an extension from the inlet water pipe, to promote rapid action, and a syphon box, to prevent dripping, collects the hottest water from near the top and leads it to the cranked delivery spout. There is also a large-bore drain plug. The whole is thickly lagged, including the top, and is enclosed in an enamelled steel container coloured cream picked out with black. The only visible projections are the gas and water pipes, the delivery spout, and the non-corrodible deposit tray.



Robustness: In the water vessel internal joints are as few as possible. The unavoidable longitudinal joint is a "lock-seam" to which solder is applied both inside and outside to ensure its complete penetration throughout. The joints at the top and the bottom of the vessel have adequate surfaces facing outwards from and as little exposed to water as possible. Attention to detail is shown, for instance, in the joint where the heat exchanger passes through the bottom of the vessel. Here a thick alloy ring compresses a rubber ring of circular section. To prevent distortion of the vessel bottom when making the joint, the metal round the edge of the hole is strengthened by rolling it round a wire which is then soldered in; the roll is, however, downwards and outwards so that the soldered joint does not come in contact with the water, as it would were the roll made in the more "natural" upward direction. The heads of the bolts which enable the alloy ring to be tightened in making the heat-exchanger joint are soldered inside the vessel, but have large flat heads, thus not only distributing the stress but protecting most of the solder in the joint from contact with the water. The nuts which engage these bolts below the ring are round and can be tightened only by means of a screwdriver thus preventing damage to bolts or rings by "excess of zeal." Further, the parts of the syphon box and other internal fittings are all made of seamless tubing of different diameters and all the necessary joints are hard-soldered. In fact, in all the soldered joints use is made, wherever technique allows, of silver or hard or brazing solder.

Speed: The speed of recovery, and with it, of course, that of initial heating-up, has been given particular attention. The full-on gas rate has been set at 7,500 B.Th.U. per hour. For temperature regulation the makers rely on their "Flap-stat," which, while retaining the reliable rod-and-tube element, applies it in such a way to the valve that this approaches its seat and takes control of the gas passed only towards the end of the temperature rise in the storage. In consequence of this combination of comparatively high initial consumption and purposely designed "stat," the initial heating-up and recovery times have been reduced to about 20 minutes. The "Flap-stat" does not provide a "snap" action; and on it separate provision is made for adjusting (1) the gas rate at the burner, (2) the by-pass rate, and (3) the water maintenance temperature; while there is a water-flow regulator on the water inlet. The burner consists of a ring with six all-gas jets mounted on it.

Servicing: Main Water Heaters, Ltd., are insistent that unless periodical inspection and servicing are arranged for no gas appliance can be guaranteed to give satisfactory and trouble-free service. The Thermain No. 2 is designed to make the work of servicing easy. In brief, the baffle is first taken from the top of the heat-exchanger, and the deposit tray and the burner ring from below, the four brass nuts and the alloy and rubber rings that together make the joint are then removed and the flue withdrawn through the bottom of the water vessel. After unscrewing the spout union and one external octagon nut, the syphon box and its connexion can be raised inside the vessel and then withdrawn through the bottom. Descaling is a comparatively simple matter and can be done by a competent man *in situ* without even removing the parts.

Brief data: Capacity, 2 gallons. Overall height, 27¼ in. × 11 in. wide × 8 in. deep. Full gas-rate, 7,500 B.Th.U./hr. Heating up time, 29 mins. Maintenance rate, 300-400 B.Th.U./hr. Maintenance temperature, 140°F.

Reporting a Record Gas Output during the year, Mr. A. Harrison, Manager of the Accrington District Gas and Water Board, said the supply position was becoming increasingly difficult. The planning of manufacture and distribution reorganization was held up until the National Coal Board decided whether the greatly increased supplies of coke oven gas required could be provided. Every effort was being made to speed up negotiations with the National Coal Board for further coke oven gas supplies. No decision had yet been reached by the Ministry on the high pressure main scheme. The accounts showed a surplus of £18,629 on the gas undertaking.

GAS STOCKS AND SHARES

Stock markets opened the week on a firm note and prices rose in nearly all sections but there were some fluctuations in the course of the week. British Funds tended to improve, while the heavy industrial market reflected interest in the shares of companies which have announced higher dividends. The registration was announced on Thursday of the Steel Company of Wales, to which reference was made in the "JOURNAL" of Feb. 12, with a nominal capital of £40,000,000 and borrowing powers of a like amount. The Company will build and operate new steel works, continuous strip mills, and tinplate mills in South Wales.

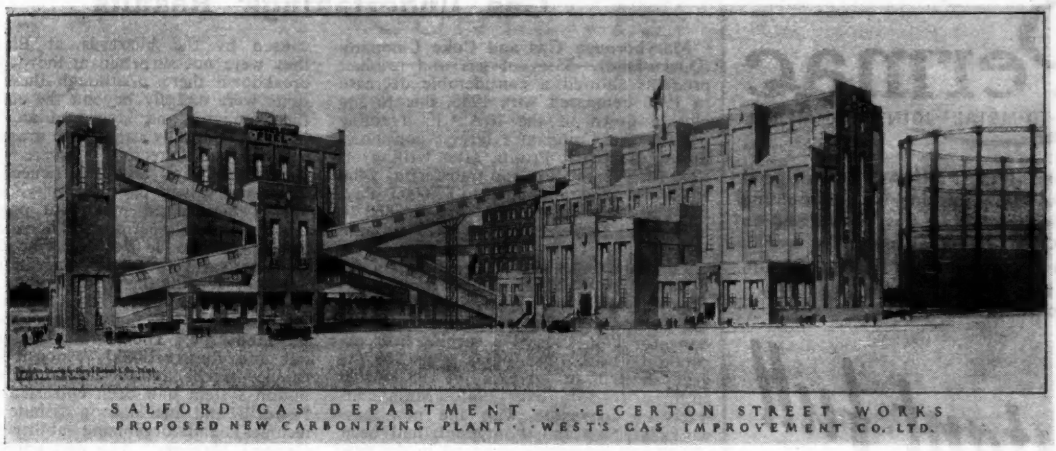
Chief interest in gas stocks centred round Imperial Continental which, after dropping one point on Tuesday, jumped five points on Wednesday and ended the week 12 points higher than quotations a month ago. Gas Light and Coke Ordinary gained 3d. The following quotations were changed during the week:

OFFICIAL LIST

Asscd. Gas & Water U'd'tgs ord. (x.d. April 30)	18/— 20/-	— 6d.
Do. defd. (x.d. April 30)	18/— 20/-	— 6d.
Brighton, &c., 5 p.c. perp. deb.	120 —125	+ 2
Gas Light and Coke ord.	21/3— 22/3	+ 3d.
Do. 3½ p.c. max.	78 — 83	— 2
Imperial Continental cap.	133 —138	+ 7
M.S Utility "C" cons.	98 —103	— 2
Montevideo, Ltd. ord.	140 —145	— 2
Newcastle & Gateshead ord.	24/— 25/-	+ 3d
North Middlesex 6 p.c.	128 —133	— 2
Do. 5 p.c. pref.	103 —108	— 2
South West. G. & W. Ltd. ord. (x.d. April 30)	18/— 20/-	— 1s.6d.
Uxbridge, &c. 5 p.c. perp. deb.	119 —124	+ 1

Quotations on the London Stock Exhange

When ex-Dividend	Dividends Interest.% Last Yr.	Prev. Yr.	NAME.	Quotations May 1
Mar. 12	4	3½	Alliance & Dublin Cons. Ord.	22/6—24/6
April 30	5	5	Asscd. Gas & Water U'd'tgs Ord.	18/—20/xd
	6	6	Do. Deferred	18/—20/xd
Mar. 12	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	20/—22/-
"	4	4	Do. 4 p.c. Red. Cum. Pref.	19/6—21/6
"	4	4	Do. 4 p.c. Irred. Cum. Pref.	19/—21/-
Feb. 26	7	7	Barnet Ord. 7 p.c. max.	158—163
Mar. 12	5	5	Bath Cons. Ord .5 p.c. basic	107—112
Nov. 18	...	10	Bombay, Ltd., Stock	50/—52/-
Jan. 29	8½	8½	Bournemouth Std. 5 p.c. sliding scale	173—178
"	7	7	Do. 7 p.c. max. div.	159—164
"	4	4	Do. 4 p.c. Pref.	101—106
"	6	6	Do. 6 p.c. Pref.	128—133
Feb. 12	...	3½	Do. 3½ p.c. Red. Deb.	95—100
Dec. 11	...	4	Do. Perp. 4 p.c. Deb.	103—108
Feb. 26	5·35	5·55	Brighton, &c., 5 p.c. Std. Cons.	105—110
"	6·3	5⅝	Do. 6 p.c. Std. Cons.	115—120
Dec. 11	...	5	Do. 5 p.c. Perp. Deb.	120—125
Feb. 26	5	5	Bristol, Gen. Cap. 5 p.c. max.	108—113
Dec. 11	4	4	Do. 4 p.c. New Deb. Red.	100—105
Mar. 12	7½	7½	Brit. Gas Light Ord.	115—120
Dec. 31	5½	5½	Do. 5½ p.c. 'B' Cum. Pref.	110—115
Dec. 11	...	4	Do. 4 p.c. Red. Deb.	97—102
Feb. 12	10	10	Cambridge U. & T. Orig. 10 p.c. Cons.	190—200
"	5	5	Do. 5 p.c. Cons. 'C'	100—105
"	7	7	Do. 7 p.c. Cons. 'B.'	135—140
April 30	...	4½	Cape Town, Ltd., 4½ p.c. Cu. Pf.	17/—19/xd
Feb. 12	6½	6	Cardiff Con. Ord.	122—127
Mar. 12	5	5	Cheltenham, 5 p.c. basic Cons. Ord.	103—108
Dec. 11	...	4	Do. 4 p.c. Perp. Deb.	98—103
Feb. 12	5¾	5¾	Chester United Ord.	120—125
Nov. 18	...	9½	Colombo Ltd., Ord.	40/—42/6
"	...	7	Do. 7 p.c. Pref.	23/6—25/6
Mar. 26	...	5	Colonial Gas Assn. Ltd. Ord.	15/—20/-
"	...	8	Do. 8 p.c. Pref.	22/6—24/6
Feb. 12	5	2	Commercial Ord.	80— 85
Dec. 11	3	3	Do. 3 p.c. Deb. Perp.	90— 95
Feb. 12	...	5	Do. 5 p.c. Irred. Deb.	117—122
"	...	6	Croydon sliding scale	118—123
"	5	5	Do. max. div.	101—106
"	...	4	Do. 4 p.c. Irred. Pref.	98—103
Dec. 31	...	4	Do. 4 p.c. Perp. Deb.	100—105
"	...	5	Do. 5 p.c. Perp. Deb.	119—124
Feb. 12	8½	7½	Derby Cons. Ord.	140—150
Dec. 11	...	4	Do. 4 p.c. Red. Deb.	100—105
Feb. 12	5	5	East Hull Ord.	97—102
"	5	5	East Surrey 'B,' 5 p.c.	100—105
"	6	6	Do. 6 p.c. Cum. Pref.	120—125
Dec. 31	...	5	Do. 5 p.c. Irred. Deb.	118—123
Feb. 26	6⅝	6⅝	East Wight Cons. Ord.	110—120
Mar. 12	5	5	Eastbourne 'A'	97—102
"	3½	3½	Do. 'B'	90—100
Nov. 18	...	5	Gas Consolidation Ord. 'A'	20/—22/-
"	...	5	Do. Ord. 'B'	20/—22/-
"	...	4	Do. 4 p.c. Red. Cum. Pref.	20/—22/-
Feb. 12	5	5	Gas Light & Coke Ord.	21/3—22/3
"	3½	3½	Do. 3½ p.c. max.	78— 83
"	4	4	Do. 4 p.c. Con. Pref.	100—103
Dec. 31	...	3¾	Do. 3¾ p.c. Red. Pref.	98—101
Dec. 2	...	3	Do. 3 p.c. Con. Deb.	93— 96
"	...	5	Do. 5 p.c. Deb.	103—106
"	...	4½	Do. 4½ p.c. Red. Deb.	104—107
Mar. 26	...	3½	Do. 3½ p.c. Red. Deb.	99—102
Mar. 12	...	5	Gloucester Cons. Ord.	103—108
Feb. 12	2	Nil	Great Yarmouth (8½ p.c. max)	13½— 15½
Feb. 26	7½	8½	Guildford Cons. Ord.	135—140
Feb. 26	5	5	Hampton C't, 5 p.c. Cons. Ord.	105—110
"	5	4½	Hartlepool G. & W. 5 p.c. Ord.	100—105
Oct. 21	...	5	Hastings & St. L. (5 p.c. Std.)	88— 93
"	...	3½	Do. (3½ p.c. Std.)	78— 83
June 17 '46	6	6	Holyhead & N. Wales Ord.	22/—24/-
April 16	6⅜	3⅛	Hornsey 3½ p.c. Std.	93— 98xd
"	7½	5½	Do. 5 p.c. Std	117—122xd
May 27 '46	8	10	Imperial Continental Cap.	133—138
Jan. 29	3½	3½	Do. 3½ p.c. Red. Deb.	98—102
April 16	7⅛	7⅛	Lea Bridge Co., Cons. Ord.	146—151xd
Feb. 12	5¼	5¼	Liverpool 5 p.c. Ord.	113—118
Mar. 12	7⅛	8⅛	Luton Cons. Ord. 'A'	130—140
"	6½	6⅝	Do. Ord. 'B'	115—120
Jan. 15	...	7	Malta & Med'n., 7 p.c. 1st Pref.	100—110
"	...	7½	Do. 7½ p.c. 2nd. Pref.	105—115
Feb. 12	5·225	5·225	M.S. Utility 'A' Cons.	98—103
"	3·722	3·722	Do. 'B' Cons.	70— 75
"	5	5	Do. 'C' Cons.	98—103
"	...	4	Do. 4 p.c. Cons. Pref.	98—103
April 30	4	4	Montevideo, Ltd. Ord.	140—145xd
Feb. 12	5⅛	5⅛	Newcastle and Gateshead Ord.	23/—25/-
Dec. 31	...	3½	Do. 3½ p.c. Perp. Deb.	97—100
Mar. 12	7	6	Newport (Mon.) Cons.	112—117
Dec. 11	...	5	Do. 5 p.c. Perp. Deb.	120—125
April 30	6⅜	6⅜	North Middlesex 6 p.c.	128—133xd
"	5	5	Do. 5 p.c. Pref.	103—108xd
Jan. 29	10	10	Northampton Cons.	104—109
Dec. 11	...	5⅛	Oxford, Cons. Ord.	180—190
"	...	8½	Plymouth & Stone Ord.	105—110
"	...	7½	Do. Addl.	14½— 16½
Mar. 12	...	5	Do. New	14— 16
Feb. 12	7¼	7½	Do. 5 p.c. Deb. Perp.	117—122
"	5	5	Portsmouth & Gosport Cons.	140—145
"	10	10	Do. 5 p.c. max.	100—105
"	7	7	Preston 'A'	170—190
June 24	46	2	Do. 'B'	132—137
Dec. 31	6	6	Primitiva Holdings, Ltd. Ord.	13/—15/-
Feb. 12	5	5	Do. 6½ p.c. Red. Cum. Pref.	100—105
Dec. 11	...	4	Reading, 5 p.c. max.	100—105
Feb. 12	5	5½	Do. 4 p.c. Perp. Deb.	98—103
Mar. 26	...	4	Romford, Ord.	105—110
Sept. 9	...	5½	Do. 4 p.c. Debs. Red.	97—102
Feb. 26	...	4½	Severn Val. Ltd. Ord.	20/—22/-
"	6½	6½	Do. 4½ p.c. Cum. Pref.	20/—22/-
Dec. 31	...	4	Sheffield Cons.	137—142
Feb. 12	...	5	Do. 4 p.c. Red. Deb.	100—105
Feb. 26	4½	4½	South East'n Gas Ltd. Ord.	19/6—20/6
"	4	4	Do. 4½ p.c. Red. Cum. Pref.	19/6—21/6
Feb. 12	5	4	Do. 4 p.c. Irred. Cum. Pref.	19/—21/
"	...	6	South Metropolitan Ord.	92 — 95
"	...	4	Do. 6 p.c. Irred. Pref.	119 —124
"	...	3	Do. 4 p.c. Irred. Pref.	98 —103
Dec. 31	...	5	Do. 3 p.c. Perp. Deb.	92 — 97
Jan. 15	...	5	Do. 5 p.c. Red. Deb.	98 —103
Jan. 29	5	5	South Suburban Ord. 5 p.c.	108 —113
"	...	5	Do. 5 p.c. Perp. Pref.	105 —110
"	...	4	Do. 4 p.c. Perp. Pref.	98 —103
"	...	3½	Do. 3½ p.c. Red. Pref.	98 —103
Dec. 11	...	5	Do. 5 p.c. Perp. Deb.	119 —124
April 30	...	5½	South West. G. & W. Ltd. Ord.	18/—20/xd
Feb. 12	5	5	Southampton Ord.	104 —109
Jan. 29	6	6	Sunderland Ord.	120 —125
Feb. 12	4½	3½	Swansea Ord.	83 — 88
"	...	5½	Do. 5½ p.c. Red. Pref.	100 —105
Mar. 12	7	6½	Swindon Cons. Ord.	117 —122
"	5	5	Tottenham Ord.	107 —112
"	5	5	Do. 5 p.c. Pref.	105 —110
"	5	5½	Do. 5½ p.c. Irred. Pref.	113 —118
"	...	5½	Do. 4 p.c. Perp. Deb.	100 —105
Dec. 11	...	4	Tunbridge Wells, 4 p.c. Sliding	125 —135
Sept. 23	...	7½	U. Kingdom Ltd. Ord.	21/—23/-
Nov. 11	...	6	Do. 4½ p.c. 1st Cum. Pref.	19/6—21/6
Nov. 18	4½	4½	Do. 4 p.c. 1st Red. Cum. Pref.	20/—22/-
"	4	4	Do. 4½ p.c. 2nd Non. Cum. Pf.	18/6—20/6
Dec. 11	...	4½	Do. 3½ p.c. Red. Deb.	100 —105
Mar. 12	...	3½	Uxbridge, &c., 5 p.c. Cap.	128 —133
Aug. 19	...	6⅝	Do. 5 p.c. Pref.	105 —110
"	5	5	Do. 5 p c. Perp. Deb.	119 —124
Dec. 2	...	5	Wandsworth Cons.	108 —113
Feb. 12	5	5	Do. 4 p.c. Pref.	98 —103
"	...	4	Do. 5 p.c. Irred. Deb.	120 —125
Dec. 11	...	5	Do. 4 p.c. Irred. Deb.	100 —105
"	...	4	Watford & St. Albans Ord.	108 —113
Feb. 12	5	5	Do. 5 p.c. Pref.	103 —108
"	...	5	Do. 5½ p.c. Pref.	115 —120
"	...	5½	Weymouth Ord. (5 p.c. Basic)	97 —102
"	5	5	Woking District "A" Ord.	190 —200
"	11	11	Do. "B" Ord.	133 —138
"	7·7	7·7	Wolverhampton Cons. Ord.	123 —128
"	8	8	York Cons. Ord.	105 —110
Mar. 26	5	5		



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